# Light and Lighting

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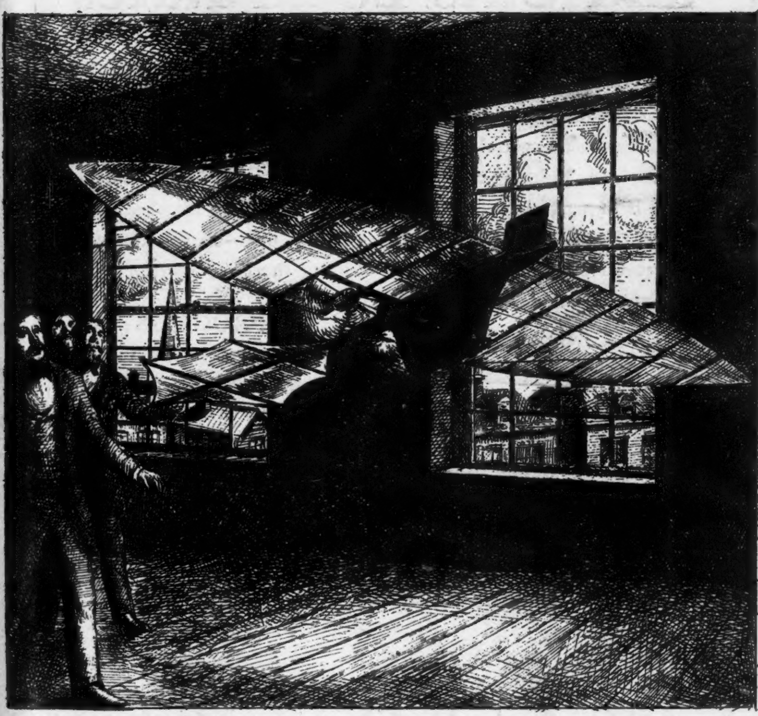

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# Light and Lighting

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## The I.E.S.

THE Annual Report of the Council of the I.E.S., published last month in the Transactions of the Society, is a record of continued growth of membership and expansion of activities. The year 1948—the fortieth of the Society—was noteworthy especially for the very successful first Summer Meeting, held at Harrogate, and for the inauguration of a Register of Lighting Engineers. At the end of 1948 the Register included the names of 39 members, and as many more have since been added to it. This move towards a professional instead of an exclusively cultural status was inevitable; but those who obtain this recognition by the Society of their competence in the practice of the art and science of lighting thereby incur no small measure of responsibility for maintaining the Society's prestige. This prestige is undoubtedly considerable and has never been higher than it is now.

# Illumination Notes and News

## *Occupational Health*

An interesting article on the place of occupational health within the framework of a public health department appeared in the April 23 issue of *The Medical Officer*, the article being by Dr. Stuart I. A. Laidlaw, Medical Officer of Health to the City of Glasgow.

The article points out that though local health services can now be said to cover the individual's needs from birth to school-leaving age and again in later life after the age of 60, the local authority has very limited powers to assist in the betterment of conditions of work during the intervening period, which is a normal man's working life. In Glasgow it is felt that in view of this gap the entry of the local health authority into the field of occupational hygiene is overdue for much of the benefit of good housing and good medical treatment can be lost in the time spent at work in an unsatisfactory environment.

Glasgow is a large industrial centre and includes some hundreds of factories within its boundaries, and Dr. Laidlaw expresses the view that there is an urgent need for an industrial health service in the area, particularly for the smaller factories where the conditions of work are known to be poor.

The opportunity to carry out an investigation into this matter arose when the manager of a medium-sized factory employing 500 operatives sought advice of the medical officer of health on how to improve the health of the employees. It was then arranged for industrially-trained medical officers from the public health department to carry out an industrial health investigation at the factory over a period of three months. The investigation was most comprehensive and covered environmental conditions in the factory, e.g., ventilation, lighting, etc., and matters personal to the workers.

One of the first results of the investigation was that the lighting was poor, highly specialised close work being conducted under an illumination of only just over two lumens per square foot at bench level. Ventilation was also poor and it is not surprising that the standard of health of the operatives was found to be low. Many correctable physical defects such as poor visual acuity were found, the majority of the patients being unaware of their medical defects.

It is evident, Dr. Laidlaw concludes, that it will be essential in the future to include on the staff of every health authority at least one medical officer who has been specially trained in industrial health work in order that this deficiency in the present environmental health service may be made good. We cannot but agree with Dr. Laidlaw that as far as lighting is concerned the benefits of such a step will undoubtedly result in increased industrial efficiency.

## I.E.S. Annual Meeting

The I.E.S. annual general meeting was held on Tuesday, May 10, at the Royal Society of Arts, London, W.C.2. We hope to give a more detailed account of the meeting and the subsequent address by Monsieur Gaymard in our next issue, but in the meantime we would report one or two matters which are of immediate interest to I.E.S. members.

In the first place the Society has recently taken postal ballots of members on two important matters. The results of these ballots were announced at the annual meeting.

The first ballot concerned a revision of the by-law governing admission to Fellowship of the Society. The notice of the ballot, which was circulated to I.E.S. members entitled to vote, explained that when Fellowship was first introduced it was intended to serve as both a distinction to outstanding people in the lighting field and, in a lesser degree, as an indication of professional competence. The Register of Lighting Engineers has now become the mark of professional ability and it was therefore proposed that the conditions for Fellowship should be revised to emphasise that it is a distinction and to raise its status. The result of the ballot was a great majority in favour of the new by-law. The conditions of admission to Fellowship are now that the applicant must be at least 30 years of age, have been a Corporate Member of the I.E.S. for at least five years and have achieved an outstanding position in, or made important contributions to, illuminating engineering.

The second ballot to which reference was made above concerned new members of Council to take office next October. The Council's nominations having been published, an independent nomination was made in accordance with the Society's articles of association. A postal ballot therefore became necessary with the result that the following were elected:—Mr. H. G. Campbell, Mr. W. J. Wellwood Ferguson, Mr. C. A. Hoskins, Mr. J. N. Hull, Mr. A. W. Jervis, Mr. E. B. Sawyer, Dr. W. S. Stiles, and Mr. D. A. Strachan.

The president, Mr. J. M. Waldram, also had to report that since his election as president for the forthcoming session, Mr. J. S. Preston found that owing to unforeseen circumstances he was unable to serve in this capacity and had asked the Council to accept his resignation. All I.E.S. members will join in expressing their sympathy to Mr. Preston that he is not on this occasion able to accept office.

The president then explained that the Council had given careful consideration to the question of filling the vacancy for president which arose under these somewhat unusual circumstances and proposed that Dr. J. N. Aldington, senior vice-president-elect, be appointed president for the forthcoming session and that Mr. W. R. Stevens be appointed to fill the resulting vacancy for vice-president. The meeting warmly endorsed the action taken by the Council.

The I.E.S. officers for the session beginning in October next are, therefore, as follows:—

*President,* Dr. J. N. Aldington; *Vice-Presidents,* Mr. L. J. Davies, Mr. C. R. Bicknell, Mr. W. R. Stevens; *Hon. Treasurer,* Mr. J. G. Holmes; *Hon. Secretary,* Mr. H. C. Weston; *Hon. Editor,* Mr. W. R. Stevens.

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## I.E.S. (U.S.A.) Gold Medal

It is announced that the 1949 Gold Medal of the American I.E.S. has been awarded to Ward Harrison. All I.E.S. members and other readers will join with us in congratulating Dr. Harrison on this well-deserved tribute to his masterly contributions to Illuminating Engineering.

# The Physical Society Exhibition

## *Exhibits of interest to the Illuminating Engineer*

This, the thirty-third, exhibition of scientific instruments and apparatus organised by the Physical Society was held in the Royal College of Science from April 5 to 8 and, as proved by the attendance, it was as popular as ever. One welcome improvement noticeable this year was the greater comfort with which novel and important exhibits could be seen, because exhibitors had been asked to refrain from showing apparatus of more interest to the engineer than to the physicist. This certainly resulted in a marked decrease in the number and variety of the "boxes of mystery" which were such a feature of last year's exhibition, those cabinets beautifully finished in battleship grey and provided with a bewildering array of knobs but as devoid of interest to the average physicist as the keyboard of a typewriter.

There were, perhaps, a rather larger number of instruments than usual which had some interest, direct or indirect, for the illuminating engineer. As would be expected, the research laboratories of the G.E.C., Siemens and the B.T.H. all had exhibits of very direct interest. There was Winch's dispersion and mask multi-purpose photometer and colorimeter, described before the Illuminating Engineering Society in 1946 and more recently before the Institution of Electrical Engineers. There was a catalogue reference to a much simplified version of this instrument in which the dispersed light was focused on to three rectifier photocells, suitably masked so that the photocurrents were respectively proportional to the C.I.E. chromaticity co-ordinates. This instrument was, however, not in a sufficiently advanced stage to be shown. Other G.E.C. exhibits were of a brightness comparator for fluorescent powders excited by short-wave ultra-violet radiation obtained from a quartz low-pressure mercury vapour lamp, and of a photometer for measuring the transmission of the coating of a fluorescent tube. In this instrument a beam of light directed along the axis of the tube was reflected by a right-angled prism to the wall of the tube and the fraction transmitted by the wall was measured with a rectifier photocell. There was also a demonstration of the effect of atmospheric conditions, particularly humidity, on the starting voltage of low pressure positive column discharge lamps.

Siemens were showing a sphere photometer for measuring the total light flux from a flash tube. This might be described as a "double-integrating" photometer since it integrated for time as well as for special distribution. The time-integrating system used was the conventional one in which an emission photocell in the position of the sphere window charged a low-leak condenser to a voltage which was proportional to the lumen-seconds emitted during a flash. The instrument was calibrated with a lamp of known flux output operating for a known length of time. Aldington's eight-strip selenium rectifier photocell for measuring the light output of a lamp in eight spectral bands, as recommended by the C.I.E., was also shown and so was the colour matching unit demonstrated by Mr. W. Harrison during the course of his paper recently read before the I.E.S.

The B.T.H. exhibits were of less direct lighting interest although the lead-sulphide and lead-selenide cells, such as those shown on their stand, may prove to have photometric applications in the not-too-distant future.

In the section occupied by the Department of Scientific and Industrial Research, the National Physical Laboratory showed a photoelectric colorimeter of the dispersion and mask type in which the mask, instead of being produced photographically, as in Winch's instrument, consisted of about 40 metal leaves each separately adjustable in height. The sensitivity curve of the photocell and the absorption curve of the optical and dispersing system were allowed for by adjusting the heights of the individual leaves with the mask in position. In another N.P.L. exhibit, light was used

for a purpose quite other than that to which the illuminating engineer is accustomed, viz., as a standard of length. Research is now in progress, both at Teddington and at the American Bureau of Standards, on the use of the wave-length of one of the radiations of an isotope of mercury (Hg 198) as a standard of length superior in reproducibility to any material standard.

A room which must have been of great interest, not only to illuminating engineers but to all who take a delight in the vagaries of vision, was that in which members of the Physical Society's Colour Group showed a number of those demonstrations described or referred to in all the text-books but seldom to be seen in practice. Who of us, for example, had not often heard of Benham's top, Bidwell's ghost and the like, without ever having had a chance to test for ourselves the remarkable appearances which were alleged to manifest themselves? The Group is to be congratulated on showing us these and a number of other ingenious demonstrations of the falsity of the saying that "seeing is believing."

The exhibits which have been mentioned above were, perhaps, the "highlights" of the Exhibition as far as the lighting engineer was concerned, but there were a number of other stands on which he could find much to interest him. For instance, both the Baldwin Instrument Company and Evans Electroselenium, Ltd., showed portable instruments designed for measuring the brightness of a cinema screen. The former firm also showed a self-contained and mains-operated photometer, while the latter exhibited a number of instruments which might be classed as photometric, e.g., a nephelometer, a colorimeter (in the chemist's sense of the term), a reflectometer and a densitometer.

Photocells of various types were to be seen on several stands, notably those of Sangamo-Weston, of Mullard's, and of Cinema-Television, Ltd. Included in the latter exhibit were a number of multiplier photocells of various types, designed to give amplification factors of between 1,000 and 5,000. Such cells are now coming into use for the measurement of very small amounts of light, e.g., in spectrophotometry with narrow slit-widths, and they were referred to several times during the discussion at the meeting of the Colour Group devoted to this subject (see LIGHT AND LIGHTING, this issue, p. 125). Incidentally, a new publication by Adam Hilger, G. F. Lothian's book on "Absorption Spectrophotometry," was to be seen on Hilger's stand near a specimen of the "Uvispek" photoelectric spectrophotometer demonstrated at the Colour Group meeting referred to above. Other interesting exhibits on this stand were the Donaldson colorimeter with six primaries instead of the customary three in order to overcome observer peculiarities when matching lights of very uneven spectral distributions. Hilger and Watts also showed, with the co-operation of Messrs. Ferranti, Ltd., a Fürth-Oliphant microphotometer with cathode ray tube display. This instrument incorporated a Hilger non-recording microphotometer, but the current from the multiplier photocell, as the beam of light falling on it traversed the spectrum image on the photographic plate, deflected the cathode ray beam, so that the tube showed a trace of the intensity variations in the spectral region scanned.

Portable photoelectric illumination photometers were exhibited by a numbers of firms, among them Avimo, Ltd., and Sangamo-Weston, but perhaps the most welcome sight was the return of the Holophane Lumeter shown by Wray (Optical Works), Ltd. This instrument, an old friend to many an illuminating engineer, has been out of production for some time. Now it has reappeared, improved to meet modern requirements, in particular those of B.S. Specification No. 230.

Finally, as an example of a somewhat unexpected application of photometry, mention must be made of Messrs. Baird and Tatlock's laundry photometer, "for measuring the cleanliness, or otherwise, of laundered articles." The subtle humour of this description (which is quoted verbatim from the exhibition catalogue) was refreshing in a somewhat ponderous volume of 272 pages, not counting the advertisements. Could not the Physical Society take a hint from one of the I.E.S. Reconstruction Pamphlets and persuade a famous "Punch" contributor to enliven the catalogue pages with some flashes of pictorial wit?

And so—after an exhausting round of the 140 stands—to bed!

# Some Notes on Flameproof Lighting and Power Installations*

By STANLEY L. LYONS, *Reg. Lighting Engineer (I.E.S.)*

The design of lighting and power circuits for use in areas requiring flameproof† treatment is in theory no different from the design of similar installations elsewhere. In practice, however, it may be found that the task is, at the present time, greatly complicated by the difficulty in obtaining the right equipment. The total number of Buxton certificated items is relatively small, and many of these are either unobtainable or at the best may be ordered only on a protracted delivery date. It is the object of the present paper to indicate a few methods of overcoming some of these difficulties, without, however, detracting from the safety of the installation, or in any way departing from the very necessary Regulations either in letter or spirit.

### The Use of Remotely-installed Switchgear

The control of large motors, lifting-solenoids, and other heavy current-consuming items presents the great problem of obtaining suitable controlling switchgear and circuit breakers, the construction of which have been covered by flameproof certificates. Where these are not obtainable, it may sometimes prove possible to house non-flameproof switches and circuit breakers in switch-houses or metal cubicles located well away from the danger areas. The current-consuming apparatus must then be connected to its relative switchgear by means of suitable lead-covered armoured cables, or by conductors run in solid-drawn steel conduits. It should be noted, however, that the whole of the supplying circuit need not be of a flameproof nature for the whole of its length. The circuit may be non-flameproof up to the beginning of the danger area, and terminated on passing into a suitable sealing box or isolating chamber connecting to a flameproof enclosure to which the flameproof part of the circuit is connected.

Wherever this general scheme of placing switchgear outside the hazard area is employed, it is necessary to consider the economic differences between such a scheme and a more conventional type of installation, where the switchgear would be of flameproof type and placed near the equipment that it controls. Although there are obvious savings in being able to use non-flameproof switchgear, the cable costs may sometimes outweigh this advantage. This especially applies to large hazard areas necessitating a long flameproof run.

It is necessary that there should be suitable control facilities for normal stop and start, inching, fault conditions, and emergency or irregular operation. Two broad methods of remote control present themselves: mechanical and electrical. A mechanical system will employ a number of push rods, links, or pulling cables which operate the distant switchgear by the application of a lever or handwheel control placed near the motor. The motor control equipment selected will open the circuit under electrical fault, etc., but, in addition, to this, it may sometimes be necessary to include other devices which will operate automatically from mechanical activation; for example, a pump-motor might carry an extra control to operate when either positive or negative pressure moves outside a pre-set safety range, or float or limit switches may be necessary. Under these conditions the total amount of signal energy available to operate the controls is usually small, and will necessitate electrical remote control, and pilot or relay cables operating at low or supply voltage must be used.

Such an arrangement will permit the

* This paper was presented at a meeting of the Junior Institution of Engineers on March 5, 1948, and published in their Journal April, 1949.

† In this paper the term "Flameproof" is interpreted as meaning "Certified as a Flameproof Enclosure under the clauses of the relevant B.S.S., and passed by the Home Office, Department of Mining, Testing Station, Buxton."

full control of the equipment from the operating position, the only flameproof items necessary being a motor, push button controller, and such limit, float, or pressure switches as the particular task requires. In general, the physical inertia of link systems makes them unsuitable for all but the shortest distances, but it is possible that in the near future wider use will be made of hydraulic and pneumatic controls.

Where the hazard area is contained within one building, it may be possible to use non-flameproof motors, which must be located in a shed or other structure outside the hazard building. The shafts transmitting the power to equipment in the danger area must pass through suitable stuffing boxes which are located in the wall. No direct access should be available for gases to pass from the process area to the motor-house, and the latter must be adequately ventilated. Under these conditions motor starters, breakers and isolators may all be controlled safely by link system operated in the danger area, the push rods again passing through glands and seals. On occasion it may be inadvisable to carry the transmission shafts through the intervening wall; an intermediary shaft should then be placed outside the building in such a way that belt, rope, or chain drives may pass from the motor-house to the intermediary shaft, and from the intermediary shaft to the danger area respectively. The intermediary shafting itself should be in the open air but protected from the weather.

### Building Lighting Installations

Some of the problems concerning lighting intallations may now be dealt with. The illumination of large isolated buildings, such as dye works, etc., can sometimes be safely achieved without using any flameproof equipment whatsoever. In the case of single-story buildings of fairly high bay, it may be possible to use high-powered floodlights or other suitable reflectors of the external type, these being mounted outside of the building and so supported and focused as to illuminate the building interior through windows in the roof.

It is necessary that the windows themselves should be of sturdy construction and not used for the purpose of ventilation. The ventilation of the building must be otherwise arranged, preferably by the use of an extractor fan and duct system discharging through a vent-stack, the height of which is sufficient to carry any explosive or inflammable gases well away from the electrical installation.

Contrary to the apparent disadvantages of this system due to glare, light loss, and inaccessibility, the system has much to recommend it, as night lighting will come from the same direction as natural illumination. The light loss per fitting can be as low as 4 per cent. or 5 per cent., especially if the fittings are arranged to throw their beams along axes perpendicular to the plane of the glass.

Regarding accessibility, it will be found a simple matter to provide, at the time of installation, an access ladder and cat-walk, with such hand-railing as is necessary; in fact, for buildings of very high bay, it may be claimed that the fittings are actually more accessible than those in a more conventional installation. This external system has an overall efficiency usually very much higher than one employing flameproof fittings. Also, at the present time, it is not possible in this country to obtain flameproof lighting fittings suitable to take a lamp greater than 300-watts size. Using a non-flameproof exterior system any standard G.L.S. lamp up to 1,500 watts may be employed.

### Low-voltage Lighting

Much economic advantage may be sometimes gained by lighting danger areas to comparatively low intensities of general lighting. The illumination may then be supplemented in particular working areas by means of low-voltage portable or plug-connected lamps which obtain their supply from the low-voltage secondary of an intrinsically safe transformer.

When employing this system, due consideration must be given to the prevention of glare, sharp contrasts of illumination should be avoided, and the intrinsic brightness of exposed parts of fittings should be limited.

Intrinsically safe transformers are so called because their short circuit or sparking capacity is very low. They generally have high impedance primary windings which are properly insulated

from the secondary. The secondary winding is placed in series with a current limiting resistor incorporated in the housing, which effectively reduces the short circuit current to a safe value. The intrinsically safe transformer may be obtained either encased in a certified flameproof enclosure or it may be mounted in an industrial closure; under the latter conditions it must be mounted away from the danger area. In view of the low operating voltage of such transformers (generally about 10 to 15 volts) it is necessary that the secondary circuit should be constructed in cables of ample capacity to avoid excessive volt drop. Furthermore, the secondary circuit route must be kept as short as possible.

Where plug and socket connection is required, it is possible to obtain a socket outlet which is certified flameproof. If the plug is withdrawn while the wires are alive, internal contacts break the circuit within a flameproof enclosure before the plug can be removed.

### Inflammable Vapours and Dusts

With some heavy inflammable vapours and explosive dusts, it may be sometimes permitted to light outdoor areas by means of non-flameproof floodlighting reflectors mounted on suitable towers or poles, or attached to building structures. Interior danger areas, such as paint-spraying booths, where petroleum-based vapours may be given off, may sometimes be illuminated by means of a number of narrow-angle floodlighting projectors mounted within the building but more than the required maximum distance from the vapour concentration.

The fittings must be so arranged that they are in a negative draught in respect to the vapour, and it may be advisable to provide an interlocking or relayed circuit which automatically disconnects the spray booth lighting circuits immediately the extractor fan circuit is opened. Alternatively, it may be possible to amount the reflectors a considerable distance away and to deflect light on to the seat of the work by means of large white diffusing screens. Sheets of glass painted white on the back, or large panels of smooth plastic material may be employed for this purpose as accidental paint spray may be readily cleaned from them, but the scheme will only be successful if the angles between lamps, diffusing panels and operators are such that there is no specular reflection of the fittings into the operators' eyes, thus causing glare.

The principle of the back re-lamping bulk-head fitting is well known. The fitting itself is a certified flameproof enclosure but there is no need to stop work and ventilate the building if it is necessary to re-lamp owing to filament failure during a shift. The back of the fitting, which is sunk into the wall, is accessible from the open air, and therefore may be opened and the lamp replaced without even the necessity of switching off the circuit to which it is connected. Subject to certain conditions the principle may be carried further and lamps may be mounted behind toughened glass panels, the framing and support of which meets with the relevant regulations.

Flameproof fittings for 80-watt fluorescent lamps are now being manufactured, and fittings for all sizes of these lamps are either available or projected. It is interesting to note, however, that the principle of flanged and gapped construction is still required, while in America the pressurised fitting has been perfected and is widely used. The principle of such a fitting is simple; a totally enclosed fitting is constructed upon conventional lines, but of much lighter construction than the British flameproof standard. Inflammable gases are kept out of the fitting by pressurising it to about 4 lb. per sq. in., regulating the pressure by an injecting nozzle and blow-off valve. It will be understood that as long as the pressure is maintained with clean air the fitting is safe. To prevent the firing of accumulated gas upon switching on, the air pressure is maintained for about 12—15 minutes before attempting to strike the lamp. In oil refineries, etc., there is usually a plentiful supply of compressed air; otherwise small compressors supply groups of lamps, the fittings being connected by copper capilliary tubing. Such fittings are not yet permissible in this country.

### Occasional Hazards

There are some locations where the explosion or fire hazard exists only on occasions; for example, when carrying on one particular process or when cleaning equipment with inflammable volatile

solvents. In such locations it may be possible to dispense almost entirely with flameproof lighting equipment. To do this, it is necessary that the supply to the lighting should be controlled by a suitable isolating switch. The lighting fittings and circuits need not be flameproof but the isolating switch must be of the certificated type if it is in the intermittent danger area.

This isolator should preferably be in a locked cubicle or fitted with a padlock. In either case the key should be in the charge of a competent person whose duty it is to open the isolator before the hazardous operation commences. The isolator or its cubicle must then be locked so that its contacts cannot be closed by an unauthorised person. A spare key should be placed in a glass-fronted box which can be opened only by smashing the glass. After the isolator is opened the personnel must either control the process by remote means, or, where this is not possible, work proceeds temporarily with the aid of flameproof torches or mining-type lamps. If this system is adopted it is advisable that free use should be made of white paint to enable easy identification of plant and exit lanes, and fluorescent exit signs should be placed in suitable positions together with routing signs of similar construction.

**Planning and Ordering Equipment**

In these days of shortages manufacturers appreciate orders which include the smallest possible number of individual items. To simplify ordering, therefore, it is often a good plan to standardise certain components. For example, by ordering two-way and four-way junction boxes only, it is possible to use them as terminal, through-way, angle-way, three-way and four-way boxes by closing the unwanted ways with solid stopping-plugs. The slightly increased cost is worth while as storekeeping is simplified and the order will very likely be completed sooner than if five different junction-boxes had been ordered.

It is hoped that this paper may be instrumental in making engineers take a second look at some of the problems arising out of present-day equipment shortages; perhaps the solution of other, similar problems may also be found by considering these methods.

In every case where there is a departure from normal practice the scheme should be first submitted to the relevant authorities for their approval in writing before work commences. In general, the Home Office Factories Inspectorate, the Local Council and the insuring Fire Company should be advised and approval obtained.

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# Standardisation: A Help or A Hindrance?

## *Report of an I.E.S. Informal Discussion*

On Wednesday evening, March 23, members of the Illuminating Engineering Society gathered at Gas Industry House for a debate on the pros and cons of standardisation as applied to lighting. The chair was occupied by Vice-President E. W. Murray and the motion "That standardisation impedes progress in lighting" was proposed by Mr. A. G. Higgins, who opened his case by a reference to the dictionary, which defined a standard as "the degree of excellence required for a specific purpose." The production of a standard, he said, was the establishment of a lowest common denominator; it meant raising the quality of the worst producer and depressing that of the best; it encouraged mediocrity and discouraged outstanding merit. In standardisation there was no room for the unexpected or the unorthodox. Certainly no one would deny the advantages of standardising the dimensions of the basic items used in lighting fittings, but this was quite different from standardising the fittings: standardise trouser buttons by all means, said Mr. Higgins, but don't let us standardise the trousers.

As an instance of a disadvantage arising from too much standardisation, Mr. Higgins mentioned the monotony, amounting to boredom, of driving along many miles of streets all lighted in precisely the same manner. He concluded

by saying that his greatest objection to standardisation was the attitude of mind that it engendered. We were all fed on standardised rations, and many of us were units in vast impersonal organisations in which any deviation from a standard pattern was severely discouraged. He wanted to see more, and not less, scope for individuality and initiative in lighting as in every department of life.

The motion was seconded by Mr. C. R. Bicknell, who said that no doubt standardisation appealed to some people because it enabled the ignorant or the indolent to be sure of getting an article that worked without any need for knowledge or discrimination on their part. He quite agreed with some standardisation of the effect to be achieved by a lighting system but not with stereotyping the means used to achieve it. The illuminating engineer had long been only too anxious to collaborate with the architect, but standardised fittings could never meet the artist's desire to have an article individually "tailored" to each separate job. Turning to the present urgent need to encourage export, Mr. Bicknell said that this country could compete with its rivals most effectively on the basis of outstanding quality and of attractive individuality, but both of these were the very antithesis of standardisation. To standardise fittings was to put an end to the lighting engineer and, in the long run, to the Illuminating Engineering Society.

Mr. W. J. Jones then opened the case for the opposition. He said that standardisation did not necessarily mean the uniform drabness so depressingly pictured by Mr. Higgins. To demonstrate its advantages he said that at present lamp manufacturers were called upon to supply no fewer than 53 different types of miner's lamps, with small and mostly unimportant differences, whereas five or six kinds would be adequate to supply all needs. He asked the members present to picture the waste of man-power and plant involved in a situation such as that, a waste which could be ill-afforded, especially at the present time. Standardisation meant making articles of high quality available at a low price. Only by such a combination could we compete in the export market. Years ago the general level of lighting was very low, and it was only by the introduction of standardisation that it had been improved. "It all comes to this," said Mr. Jones, "if you want the freedom to choose what you like, you have to pay for it."

The opposition to the motion was seconded by Mr. B. F. W. Besemer, who said that the demand for standardisation came from users, makers, and distributors alike, partly perhaps because of the instinctive British distrust of the expert. Standardisation reduced accidents and speeded production, and the need to-day was for more and better standards, both national and international.

In the general debate that followed the opening speeches, Mr. Gowshall said that people only objected to standardisation because they did not understand it fully. It did not stifle improvement because there was no upper limit; anyone was at liberty to make things as much better than the standard as he liked. The stocks which had to be carried could be greatly reduced by standardisation and careful planning; by using different arrangements of standard parts great variety could be obtained at low cost.

Mr. F. C. Smith said that there were two classes of standards, viz., those for dimensions and those governing performance. Standards were not set at the lowest level but at a mean; they prevented much material of inferior quality getting on to the market, and enabled goods to be bought with a guarantee that they were up to a recognised level of excellence. He thought that the standardisation of articles was essential, but that it was undesirable to standardise methods of achieving a result. Mr. Penny said that there was no possibility of impeding progress by standardisation: progress was inevitable and standardisation cleared the field for the best man who was thus not hampered by the mediocre. Mr. Evans cited the periodical revision of British standards (such as No. 161, for example) to show that standardisation did not impede progress.

Mr. J. M. Waldram said that it was necessary to distinguish between dimensions and quality of materials on the one hand and, on the other, the art of using them, which could not be standardised. At all costs the freedom of the individual must be preserved. He

suggested that more standards meant less thinking, and when he was confronted with a chart showing that 1,500 committees were working on the preparation of standards, he could not help feeling that such an imposing expertise could not but impede progress.

Mr. Walker pointed out the danger that in some cases a specification might prevent the use of a new material which, although quite suitable for its work, might not satisfy all the requirements or pass all the tests laid down. Mr. Stanley said that a specification was not for a standard article but for a standard of quality which an article should reach to ensure satisfactory performance.

An unusual point of view was expressed by Mr. Heald, who said that it was quite possible for standardisation to raise costs because mass production by a large concern meant more overhead than in the case of a small producer making a non-standard article. He asked if there was any instance, apart from that of lamp manufacture, in which standardisation had furthered progress. Mr. Harris said that with regard to fittings for fluorescent lamps a certain amount of standardisation was needed, particularly in such matters as overall efficiency, angle of cut-off, etc., while a standard of quality for the material used was also necessary.

Mr. Counter put forward two points of view, viz., that of the consumer, for whom standardisation was a great protection against shoddy goods, and that of the workman who found the making of specialities very vexatious and time-consuming.

At this stage the chairman called upon the opening speakers to reply to the various points that had been raised. Mr. Bicknell submitted that from the point of view of the proposers there was no case to answer, partly because much of the discussion had been directed to non-lighting matters. He dealt with a number of points and concluded by saying that he was not so much opposed to standardisation when tempered with good sense, as to a passion for standards run out. Mr. Higgins was more uncompromising. He said that progress meant the development of new ideas and the creation of beautiful things, both impossible with standardisation. The creative worker was better off than the man making a standardised product. Further, minimum standards showed a strong tendency to become maximum standards.

Mr. Jones followed with an endorsement of Mr. Gowshall's and Mr. F. C. Smith's points, particularly as regards the necessity for the standardisation of parts and its value in ensuring satisfactory performance and guaranteeing against excessive maintenance. He agreed whole-heartedly that there must be no cramping of new ideas or discouragement of creation of the beautiful; on the other hand this could be achieved more easily and quickly if standardised parts were used. Everyone desired to have the best goods available, and these were goods which complied with the requirements of a British Standard Specification.

The chairman then summed up the debate as, in accordance with the usual practice of the Society on such occasions, no vote was taken. Mr. Murray said that there was evidently general agreement that small parts and accessories should be standardised. Similarly, it seemed to be more or less accepted that no standardisation of methods of lighting design was desirable. About the standardisation of fittings there was evidently much difference of opinion; in any case the use of standards could not do away with the need for skill and knowledge on the part of the lighting engineer and with this dictum, which cannot have failed to commend itself to every member of the I.E.S. present, the meeting ended.

## N.P.L. 'Open Day'

The National Physical Laboratory at Teddington is holding an "Open Day" on Thursday, May 26, from 2.30-6 p.m., to which representatives of industrial organisations are being invited.

This is an opportunity for members of industry to see the wide range of scientific research and investigational work undertaken at the laboratory and a number of tickets are being reserved for postal applications.

Accredited representatives of industrial organisations who would like to visit the laboratory and who are not already in contact with its work are invited to apply to the Director, National Physical Laboratory, Teddington, Middlesex, not later than May 14.

# Colour Matching

## A description of the new Siemens Industrial Unit

### Need for Suitable Illuminant

Colour matching is essential in many industries, for example, in paint manufacture, colour printing, the dyeing of fabrics and the preparation of foodstuffs, and must be performed with a high degree of precision. The task of the colour matcher is to ensure, where necessary, that coloured products made on different occasions or by different works shall appear of identical colour. By experience he acquires a keen sensitivity to small colour differences; differences which are often imperceptible to the untrained eye.

This precise colour matching demands a suitable illuminant because the colour appearance of the material is determined by the colour-rendering quality of the light which illuminates it.

### Natural Daylight

In general, materials are most frequently seen in daylight, and it is logical that their colours when viewed in natural light should be accepted as their true ones. A further reason why this should be so, however, is that the spectrum of daylight is regular and continuous, approximating to that of a total radiator or black body at the same colour temperature. Natural daylight has thus no serious deficiency or surplus in any part of the visible spectrum and neither subdues nor accentuates the colour of an object seen under it.

The colour matcher, however, knows that daylight is very variable in quality and quantity due to the varying proportions of sunlight and skylight and the effect of clouds and the atmosphere. To ensure the most constant and reproducible condition he thus invariably works under north skylight. The colour temperature of this phase of daylight is generally accepted as 6500°K though in the more southerly latitudes of the U.S.A. colour temperatures of 7000—8000°K are recognised.

### Artificial Daylight

Natural daylight is not only variable both in quantity and quality, but reliance on it obviously restricts work to a limited number of hours and days. A suitable source of artificial daylight has thus been a long-felt need of colourists, and much scientific research has been devoted to its pursuit.

The most important requirement of an "Artificial Daylight" is that it shall have a spectral distribution aproximating as closely as possible to that of a natural daylight or black body radiation at the desired colour temperature, i.e.,

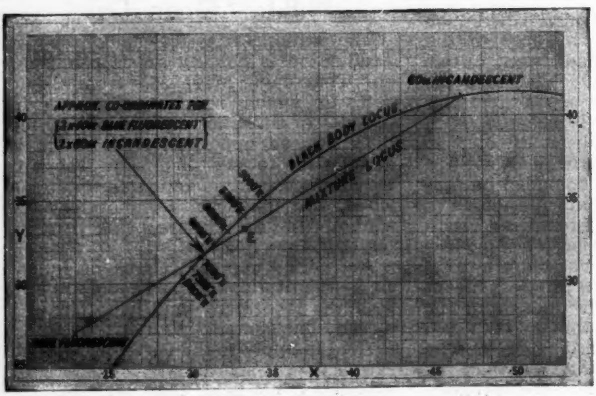



Fig. 1. Black body locus and locus of mixture of blue fluorescent and incandescent light.

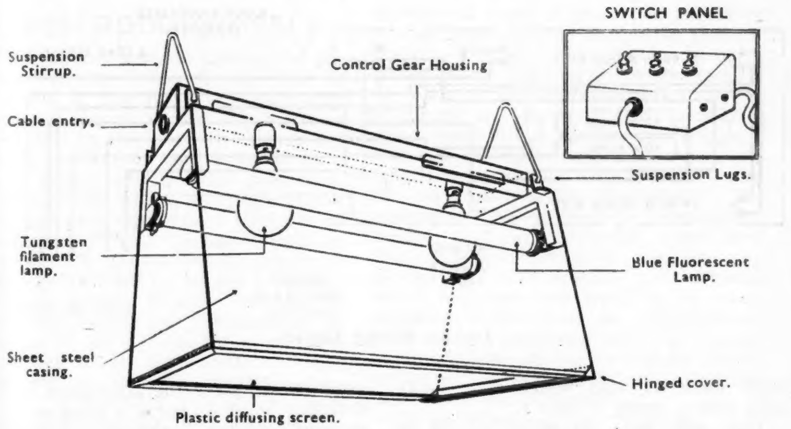



Fig. 2. Showing details of the new colour matching unit.

usually 6500°K. Other requirements are that its quality should be easily reproducible to close tolerances on the spectral distribution and be maintained throughout life, and that the working area can be lighted uniformly and to a high luminous intensity. Naturally, a light source of high luminous efficiency is desirable.

### The New Unit

The light from a tungsten filament lamp has a spectral distribution practically identical with that of black body radiation but its colour temperature is low: most lamps fall in the range 2600—2900°K. Compared with daylight, the light from a tungsten filament lamp is deficient at the blue end of the spectrum. This deficiency can be corrected by combining the light from the tungsten lamp with that from a special "blue" fluorescent lamp. This is the principle of the Siemens Industrial Colour Matching Unit, which employs two 2 ft. 40-w. blue fluorescent Sieray lamps and two 60-w. pearl single coil gasfilled filament lamps. The light from these lamps is blended and diffused within the unit to give a spectral quality almost identical with that of natural daylight at a colour temperature of 6500°K.

Figure 1, which is a section of the C.I.E. chromaticity diagram, shows the black body locus and the locus of the mixture of blue fluorescent and incandescent light. It will be noticed that the mixture locus follows closely to the black body locus in the region 5000—7000°K, which indicates that if the proportions of blue and incandescent light vary a little through life, the colour temperature is slightly changed but the black body colour (and spectral distribution) is maintained at the new colour temperature within a very close tolerance. Such colour temperature variations are only likely within a range much smaller than the changes encountered

**Table I.**

**Technical Data.**

| | |
|---|---|
| Dimensions | ...Overall—24 in. by 18½ in. by 14 in. deep. |
| | Window—24 in. by 18 in. |
| Weight | ...30 lb. (complete with lamps and gear) |
| Supply | ...200/250 v. 50 cycles A.C. |
| | (Can be adapted for other supplies) |
| Chokes | ...Two used in parallel |
| Power Consumption | ...220 w. (approx.) |
| Power Factor | ...With 60-w. G.L.S. lamps approx. 0.7 at 230 v. and 0.65 at 200 v. Capacitor can be fitted to correct to 0.85 |
| Illumination (Lm/sq. ft.) | ...On working plane 3 ft. below unit—45 |
| | On working plane 5 ft. below unit—20 |

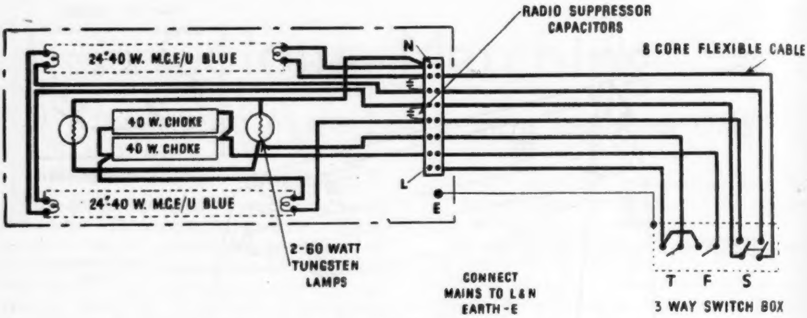



Fig. 3. Wiring diagram.

with north daylight which may easily vary over a range of 1000°K.

This unit with its 24 in. by 18 in. diffusing window is a large area source of low brightness comparable with a window illuminated by natural daylight. For a total unit consumption of approximately 220 watts the lamps produce approximately 3000 lumens of light which,

**Table 2.**
**Spectral Distribution.**
**(Expressed in percentage luminance in eight spectral bands.)**

| *Waveband. Å* | *Siemens Unit* | *6500°K Black Body* |
|---|---|---|
| 3800—4200 | .017 | .032 |
| 4200—4400 | .365 | .26 |
| 4400—4600 | .66 | .83 |
| 4600—5100 | 10.2 | 10.65 |
| 5100—5600 | 44.5 | 41.8 |
| 5600—6100 | 34.4 | 35.8 |
| 6100—6600 | 10.0 | 9.9 |
| 6600—7600 | .85 | .68 |

**Table 3.**
**C.I.E. Chromaticity Co-ordinates.**

| | *x* | *y* | *z* |
|---|---|---|---|
| Siemens Unit (with 60-w. lamps) | .310 | .320 | .370 |
| 6500°K. Black Body | .314 | .324 | .362 |

after allowing for the absorption of the diffusing window, permits samples to be examined under illumination intensities of 20 to 50 lumens per sq. ft. A separate switch for the blue fluorescent lamps enables them to be switched off when it is desired to examine samples under incandescent light alone.

The unit may conveniently be started by means of a simple 3-way, manual operated, switch block (see wiring diagram, Fig. 3). Switch T operates the filament lamps. To switch on the fluorescent lamps switch F should be turned to the ON position, followed by S which should be pressed down in the "ON" position and released after about three seconds' delay.

## Maintenance

The rated life of the incandescent filament lamps is 1,000 hours, and that of the fluorescent lamps considerably longer. Although it is not essential to replace the lamps before they fail it may be convenient in some cases to replace all the lamps after 1,000 hours' burning to ensure maximum performance.

Precautions have been taken to render the lamp chamber as dustproof as possible. It is, however, impossible to prevent the unit "breathing" when the air in the lamp chamber expands and contracts with changing temperature. A small amount of dust may therefore be introduced into the interior of the fitting during operation. Steps should therefore be taken to ensure that the interior reflecting surfaces of the case are kept clean and that the lamps are periodically washed. The diffusing screen should also be kept clean.

# Spectrophotometry

At the annual general meeting of the Physical Society Colour Group, held at the rooms of the Royal Photographic Society on March 30, Dr. W. S. Stiles was elected to the chair, in succession to Mr. J. G. Holmes, and a report on a year of great activity was presented. The discussions at the meetings of the Group cover a number of subjects of considerable interest to many lighting engineers, and it may not be generally known to readers of LIGHT AND LIGHTING that any member of the Illuminating Engineering Society has the privilege of belonging to the Group for a nominal subscription of 5s. per annum.

The annual general meeting was followed immediately by a discussion on spectrophotometry, a subject which has increased rapidly in importance of recent years, especially in the chemical field. The opener was Dr. T. Vickerstaff, of Imperial Chemical Industries, who gave a most interesting account of what he had seen of spectrophotometric and colorimetric instruments and practice in the United States during a recent visit to that country. He first mentioned the Hardy recording spectrophotometer, an instrument which will give the complete spectral reflectance curve of a material in less than three minutes. It is an expensive instrument, costing some $10,000, but Dr. Vickerstaff said he had been amazed at its widespread use; every university seemed to possess one, and one large chemical organisation had no fewer than nine. Then he turned to the Cary recording spectrophotometer, a very sensitive and rather expensive instrument which made use of a multiplier photocell and could work with a slit-width of only a few Angstrom units. Of the non-recording instruments the Beckmann was the most popular, as it was comparatively cheap and very handy to use. Dr. Vickerstaff mentioned also the Hunter reflectometer, which, by means of six photocells, gave a measure of the reflectance and of the chromaticity co-ordinates of a coloured sample. He also referred to the automatic integrators used for obtaining the chromaticity co-ordinates of a sample directly from the spectral reflectance curve.

After Dr. Vickerstaff had answered several questions from members of the very large audience present, Mr. H. G. W. Harding, of the National Physical Laboratory, gave a useful account of some of the basic principles of spectrophotometry and of the possible sources of error. In particular he mentioned stray light and the desirability of using a double monochromator to eliminate it. He said that there was great need for a device which would alter the slit-width with change of wave-length so as to give a wave-length band of constant width throughout the spectrum. He referred to temperature control and, in conclusion, mentioned that it was desirable to use the conditions of illumination and viewing which had been laid down by the International Commission on Illumination, viz., normal incidence and 45 degrees angle of view. In the case of the Hardy instrument it was the diffusely reflected light that was measured.

Dr. A. Sommer, of Electrical and Musical Industries' Research Laboratories, then gave an account of recent development in photocells of the emission type, particularly multiplier photocells, which are now rapidly increasing in importance. He showed curves of spectral sensitivity and described the construction of different types of cells. The multiplier cell, he said, was principally of use when the amount of light available was very small, currents of as much as 30 microamps per lumen being obtainable.

The next speaker was Mr. J. R. Stansfield, of Hilger and Watts, Ltd., who dealt with details of design in spectrometers. He referred to the need for using an intense and steady source of light and for the complete elimination of stray light. The photocell, he said, should preferably be used solely to indicate equality of two radiations.

Mr. G. T. Winch, of the G.E.C. Research Laboratories, sent a written communication, which was read by Mr. R. G. Horner, the secretary of the Group. He set out the requirements which had to be met by the dispersion and mask method of colorimetry or of abridged spectrophotometry (see LIGHT AND LIGHTING for March, 1946) if it was to equal the accuracy attainable by visual methods under the best conditions of observation. In particular he described the precautions which had to be taken in making the masks, and the photographic process used for the purpose.

The meeting concluded with a demonstration of the new Hilger Uvispek photo-electric spectrophotometer.

# LIGHTING AT THE B.I.F.

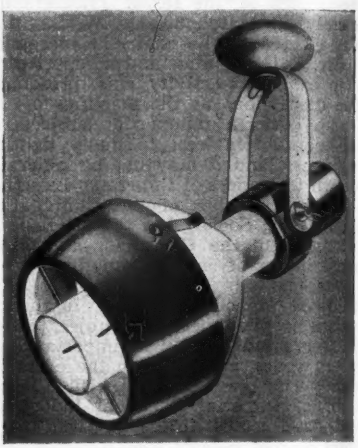
The twenty-eighth British Industries Fair was held during May 2-13 with sections in London and Birmingham. The number of exhibitors in the Engineering and Hardware Section at Birmingham was 1,161, a record for this section of the Fair.

As usual, a number of firms in the lighting industry exhibited.

The British Thomson-Houston Company showed a range of lamps and lighting equipment for various purposes, fluorescent lamps from the 18-in., 15-w. to the 8-ft., 125-w. being on view. "Mazdalux" industrial and commercial fittings for use with 40-w. and 80-w. fluorescent lamps in many applications were shown. Of particular interest was a corrosion-resisting fitting which has been specially designed for the lighting of industrial premises where acid fumes, steam and other vapours may be present. It is of plastic construction with the exception of two rubber end-covers, which completely seal the interior of the fitting from the surrounding atmosphere.

Mine lighting fittings for roadway lighting and coal-face lighting were also on show. Street lighting fittings included both fluorescent and mercury vapour types. The latter included the "Mazdalux" Horizontal Enclosed lantern, for use with 250- or 400-w. discharge lamps. This lantern gives a controlled cut-off and is constructed almost entirely of silicon-aluminium alloy, the magnetic reflector gear being carried on bearers above the anodised aluminium reflector.

Crompton Parkinson, Ltd., showed fittings of various types, some of which were installed as stand lighting fittings.

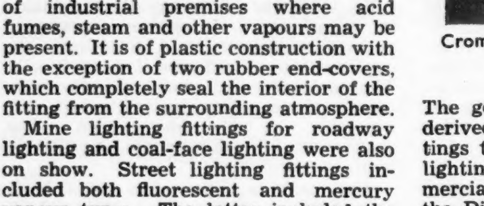


Crompton display spotlight with internally silvered lamp.

The general lighting of the stand was derived from decorative fluorescent fittings typical of those available for the lighting of offices, shops, hotels and commercial premises. Amongst these was the Display Spotlight, which is for use with a special 150-w. internally silvered lamp. The fitting consists of a universally adjusted bracket with a skirted E.S. lampholder and a control ring designed to slip on to the lamp. The fitting is very useful for the lighting of shop interior displays and show windows.

The focus of the Ekco-Ensign display was on fluorescent developments, but their full range of tungsten and special lamps (from 15 to 1,500 w.) was on show. Fluorescent fittings included those for 5-ft, 4-ft., and 2-ft. lamps in daylight, warm white and peach colours, whilst accessories and control gear included ballasts, starter switches and sockets, bi-pin and pantograph lampholders and the Ekco Autostart unit.

The General Electric Co., Ltd., showed some of their decorative and industrial fluorescent fittings. There was also a selection of Osram



G.E.C. 2-ft. ceiling fluorescent fitting.

Mazdalux Horizontal Enclosed street lighting lantern.

fluorescent lamps ranging in size from the 18-in. tube to the 8-ft. tube. Cold cathode lighting was represented by means of an illuminated cornice around the roof of the stand.

The Revo Electric Co., Ltd., gave particular attention to their "Trufolite" and "Fullalite" reflectors, which were used to illuminate the stand where exhibits other than lighting equipment were shown. The selection of street-lighting fittings included new and established patterns for use with mercury, sodium and tungsten lamps, together with the "Sol-etern" lantern for fluorescent lamps. These latter fittings are now made to house two 20-w. or two 40-w. 2-ft. lamps, two 80-w. lamps and four 80-w. lamps. Concrete and cast-iron standards were also shown.

A feature of the Thorn Electrical Industries' exhibit was a dimming device for fluorescent lamps, which was intended to show that fluorescent lighting can effectively replace incandescent lighting for stage and auditorium lighting. The advantage of fluorescent lamps for these applications is the higher efficiency obtained, particularly with coloured lamps. Fluorescent lighting units on show included types for industrial, commercial and residential use. Incandescent lamps and control gear for fluorescent lamps were also shown.

Other exhibitors included Aladdin Industries, Ltd.; British Foreign and Colonial Automatic Light Controlling Co., Ltd.; Davis Bros.; Falk, Stadelmann and Co., Ltd.; Hailwood and Ackroyd, Ltd.; L. G. Hawkins and Co., Ltd.; Joseph Lucas, Ltd.; Longlamps, Ltd.; Oldham and Son, Ltd.; Sangamo Weston, Ltd.; Simplex Electric Co., Ltd.; Tilley Lamp Co., Ltd.; Walsall Conduits, Ltd.

# New Lighting Installations

### A London Transport Works

A fluorescent lighting installation using 300 G.E.C. continuous trough fittings has been brought into use in the fittings area of the car body shop at the Acton Works of the London Transport Executive. The shop was built before the war, and during the war years was used for tank production. It was converted recently to fulfil its new function, namely the regular overhaul of all passenger rolling stock, both of the tube and surface lines, on the London Transport railways. An average of 23 cars a week is turned out of the shops.

The fittings area deals with the inspection and maintenance of all equipment detachable from the car bodies, ranging from items such as the locks on the compartment doors of Metropolitan line stock to the electrical control gear on motor coaches and driving trailers. In addition to the servicing of electrical and mechanical parts, an important function is the overhaul of pneumatic apparatus, including door engines for operating sliding doors, and the valves of electro-pneumatic contactors. A special testing area for pneumatic equipment is in course of erection.

One portion of the fittings area is devoted to drawgear overhauls. These parts, which in service are exposed to grease and dirt, pass through a soda washing plant before being delivered by overhead crane to the appropriate benches for inspection.

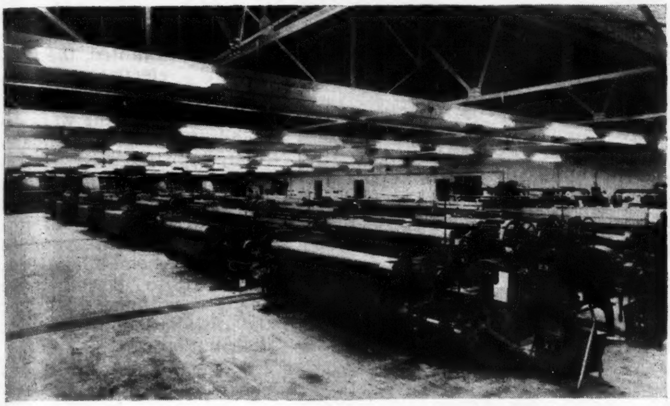
The car body shop, as a whole, is 400 ft. long by 100 ft. wide and in the fittings area there are three parallel runs, spaced 9 ft. 3 in. apart, of 5 ft. fluorescent lamp continuous trough fittings, each run being 380 ft. long. Shorter continuous runs of fittings are provided in adjacent areas, e.g., the drawgear section and the store. The fittings are mounted at 13 ft. 4 in. above ground level by means of chains from pipes fixed on the roof trusses. This gives an illumination of 28-29 ft.c. on the benches. In the crane areas, to obtain clearance, it was necessary to raise the fittings to 18 ft. above ground level, and the illumination on the machines in these areas is 21 ft.c.

All the fittings have self-contained control gear giving instant start operation, and are arranged for London Transport's $33\frac{1}{3}$-cycle 3-phase 4-wire supply.

Electrical and compressed air supplies are taken to the benches by means of an overhead busbar system, the down-leads from which carry labels at a convenient height showing the type of equipment dealt with in each section.

The fittings were supplied by the G.E.C., Ltd., and the lighting installation and power supply work was carried out by the Signal Engineers Department, London Transport Executive.

View of the servicing benches showing the three runs of fittings each 380 ft. long.



Arcon lighting system in a weaving shed.

### Weaving Shed Lighting

The illustration at the top of this page shows a view of an installation which has recently been carried out in one of the weaving sheds of Messrs. Marling and Evans, Ltd., at Stonehouse, in Gloucestershire, by Arcon, Chartered Architects. It consists of 72 80-w. fluorescent lamps, and the whole job was installed in 72 man-hours. All the lines of trunking were prefabricated and assembled on the floor of the shed in the appropriate positions. The wiring, reflectors, and lamps were then added, and the complete assembly was slung up to the roof trusses, connected to the mains, and switched on.

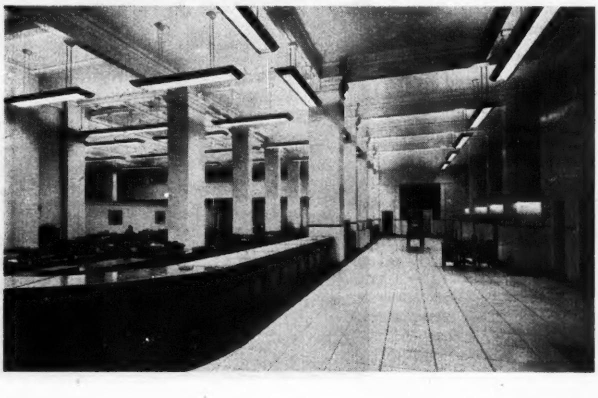
### C.P.R. Offices

A principal feature of the recent installation in the concourse and offices of the Canadian Pacific Railway Co., Ltd., at the Royal Liver Building, Liverpool, is the special pendant louvred fittings designed by the B.T.H. Co. and used in the main hall. They are constructed of metal sections to match the moulding of the capitals to the pillars, and vary in length from 6 ft. (containing two 80-w. daylight lamps) to 16 ft. (containing nine 80-w. daylight lamps).

A remarkable degree of uniformity of illumination is achieved despite many dividing screens and obstructions, an average of 28 lumens per sq. ft. being recorded after the first 100 hours.

The contractors were Messrs.

Office lighting at the Liverpool offices of the Canadian Pacific Railway Co. Ltd.



Troughton and Young, Ltd., and the installation was designed by lighting engineers of the B.T.H. Co., the work being co-ordinated by the architect, Mr. C. Howard Crane.

Another fluorescent lighting installation planned by lighting engineers of the B.T.H. Co., Ltd., has recently been put into operation in part of the Perivale factory of Hoover, Limited, the well-known electric suction cleaner manufacturers.

The nature of the work demands lighting of comparatively high intensity. Constant improvement in methods occasionally calls for rearrangement of the production processes, and the lighting scheme has been arranged to permit these changes without disturbing the installation or the light distribution.

The bare-lamp fitting was chosen because all the ceilings have cross-beams spaced approximately 6 ft. apart running across the rooms which act as screen to the bare lamps, and also because the method of mounting employed enables overhead conveyors and other steel superstructures to be used under practically shadowless illumination.

An average intensity of approximately 30 lumens per square foot is provided by the "Mazdalux" 5 ft. twin-lamp fluorescent fittings mounted direct on the flat ceilings.

Benjamin Fluroliers set above a false ceiling and fitted with glass visors in the Metrology Laboratory of Enfield Technical College. At first sight these fittings appear to be without means of support.

# REVIEWS OF BOOKS

*Fundamentals of Discharge Tube Circuits, by F. J. Francis, A.R.C.S., B.Sc. (Methuen's Monographs on Physical Subjects, London* (1948)). 134 *pp. with* 40 *diagrams. Price* 6*s.* 6*d.*

*An Introduction to the Science of Artificial Lighting, by R. O. Ackerley, M.I.E.E. (Spon's Architectural and Building Series, London* (1948)). 135 *pp. with* 73 *diagrams and illustrations. Price* 12*s.* 6*d.*

These books make a useful contribution to the practical scientific knowledge which must be familiar to those who practise the art of lighting. Although the proper design of lamps, of fittings and of lighting installations has become more and more a specialised field of work, the variations within this field are so wide that the worker needs to have a background of scientific knowledge in many different subjects and these two books take their place in the series of small authoritative text books which have become available in recent years.

Mr. Francis's book is admirably described by its title. It deals with fundamental principles rather than practical details and with gas and vapour discharge tubes in general, although it refers particularly to mercury and sodium discharges of the positive column type. The theory of the stable operation of a discharge tube is very clearly described, first for direct current and then for alternating current, with special consideration of the dynamic characteristics of circuits, voltage and current wave forms, and the initiation and extinction of the discharge. The last chapter deals with the design of circuits for discharge lamps and gives interesting data for some typical lamps. The book has been based on a course of lectures given to people concerned with the applications of discharge lamps and makes a full survey of the subject in terms which are readily understood by anyone with knowledge of some aspect of engineering. The fundamental properties of discharge tubes in relation to the operating circuits are described in electrical units rather than luminosity units and are given in diagrams and simple formulae rather than as tables of the rated values for actual lamps. The treatment is surprisingly comprehensive for so small a book. Discharge lamps are so common nowadays that any lighting engineer is likely to meet application problems which are beyond the scope of published descriptions of the usual circuits and this book may be confidently recommended to lighting engineers wishing to be able to answer such problems.

In the foreword to Mr. Ackerley's book, he explains that it is intended primarily for the architect or consulting engineer who wishes to be informed of the recent important developments in the technique of artificial lighting, so as to be able to offer sound guidance to his clients and to appreciate the specialised contribution which a lighting engineer can make. It is not a book on science, but rather on principles of design which have developed from practical experience. The author may be congratulated on the way in which he has contrived to embody the essentials of good lighting practice in a book of modest proportions and there is little doubt that this manual will find its way to many bookshelves other than those of the architectural profession.

The first section of the book briefly reviews the scientific background which is fundamental to the proper understanding of artificial lighting and prepares the reader for the two further sections on installation design and lighting practice. There is a comprehensive chart of the many factors involved in the design of an installation, so complex as to impress and perhaps to terrify an architect and so detailed as to make a lighting engineer wonder whether he really does consider all this, and the author has necessarily been restricted to basic principles and general guidance in his notes on each factor. It might be wished that more space had been devoted to certain aspects of lighting practice and particularly to the techniques of architectural lighting and of built-in installations which should be created by the architect as part of the structure, as windows are, and not added with less satisfactory results after the principal items have been settled.

There is a fine collection of photographs which will appeal particularly to architects and engineers although some of them might be criticised by an observant lighting engineer. Photographs fail to convince when the apparent lighting has been reinforced by a flash behind the camera or when the fittings in a "concealed" lighting installation are clearly seen.

# I.E.S. ACTIVITIES

### Nottingham Centre

On Friday, February 25, the Nottingham Centre held their first ladies' evening. The function was held at the George Hotel, Nottingham. Mr. W. K. Martin, the Centre chairman, presided, and the Centre was honoured by the presence of the Lord Mayor and Lady Mayoress of Nottingham, the Sheriff of Nottingham, and Mr. C. R. King, the chairman of the East Midlands Electricity Board. The I.E.S. President was, unfortunately, unable to be present owing to a previous engagement.

After the dinner the toast of "The City of Nottingham" was proposed by Mr. E. G. Phillips, a past-chairman of the Centre, to which the Lord Mayor (Councillor John E. Mitchell) replied, saying how delighted he was to be present, and trusting that the Society would continue with the good work which it had done in the past, particularly during the war years. The toast of "The Ladies" was in the capable hands of Mr. G. C. Small, a member of the Centre Committee. The response was made by Mrs. C. S. Caunt, wife of the former hon. secretary of the Centre, and who has for many years presided over the tea trolley at the monthly meetings.

The toast of "The Nottingham Centre of the I.E.S." was proposed by Mr. C. R. King, who praised the work of the Society. The response to this toast was made by the Chairman, who hoped that this function would be a forerunner of many others in the future.

Considerable comment was made on the special lighting effects in the banqueting room. Foremost amongst these was the motif of the Society in fluorescent paint, which had been constructed by Mr. J. C. Charity, a former chairman of the Centre.

Following the dinner, members and guests joined in dancing, during which a number of prizes were distributed. So successful was the function that immediate arrangements were made to hold the next ladies' evening on February 17, 1950.

### Birmingham Centre

The April meeting of the Birmingham Centre was the last meeting of the session, but no end-of-season staleness was apparent as a crowded room listened attentively to Mr. L. H. Hubble's slightly controversial paper on "Decorative Lighting."

During the discussion the importance of using fluorescent sources which would make food look attractive was raised. Another important point emphasised was the necessity for the lighting engineer to absorb the atmosphere of the building or room so that the lighting he installs and the design of the fittings he uses might be in complete harmony with the surroundings.

Mr. Lovell, who proposed the vote of thanks, expressed his appreciation of the slides shown, and was slightly envious of the lecturer's opportunities for such lavish schemes. Mr. V. Heydon, who seconded the vote, stressed the stimulating effect of the paper.

### Newcastle Centre

On April 6 the Newcastle Centre had a paper on "The Maintenance of Lighting Equipment and Installations," by one of their own members, Mr. R. P. Wingate.

Mr. Wingate said that to maintain an installation in a reasonable condition several factors had to be taken into account. The first, and rather obvious, point was that fittings should be cleaned at regular intervals, as in a very short time the light output of fittings could be reduced by as much as 50 per cent. by accumulation of dirt and dust. He also stressed the advantages of planned lamp replacement, and recommended that simple records of lamp replacement be kept, as these would not only serve to indicate when lamps were reaching the end of their rated life but would also indicate the service which the user was getting from the lamps.

The author dealt with many other points on the maintenance of both tungsten and fluorescent lighting installations. A number of members took part in the discussion following the paper.

# Shop Window Lighting Fittings

With the removal of restrictions on shop window lighting, fittings for this purpose are once again in demand. The following are a few of the fittings which have recently been introduced.

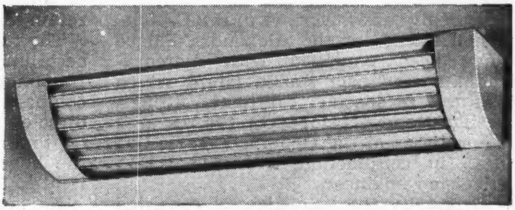
COURTNEY, POPE (ELECTRICAL), LTD., have introduced two new fittings, the F9 and F10. The F9 is specially designed with glare shields fitted on to the lamp, the fitting being installed in windows where it can be fitted on the soffit, one side of the fitting acting as a pelmet if the transome is shallow. This fitting is a two-lamp unit and is made for either 2-ft., 3-ft., 4-ft. or 5-ft. fluorescent lamps. Provision is made for 150-w. tungsten spotlights to be fitted at the ends of the unit. The F10 fitting is designed for high windows where there is a deep transome.

This firm also announce that they are making a special unit for island windows and are specialising in Louverall ceilings.

The F45500 shop window fitting designed by THE GENERAL ELECTRIC CO., LTD., is convenient for use singly or in conjunction with others of the same type according to the size of window, the gear tray having terminal blocks at each end for through wiring to adjacent fittings. The fitting consists of a light but robust metal frame supporting four 5-ft. 80-w. fluorescent lamps in front of a convex anodised aluminium reflector designed to give wide distribution of light. The end pieces, finished in cream stove enamel, are hinged at the front to give access to the lampholders.

The gear tray, with cubic type gear, is carried in the light, open framework at the back of the reflector, so that all components are readily accessible when the tray is in position. The tray is detachable, enabling it to be wired up on the bench before being mounted in the fitting. The cable can be brought in at any point behind the reflector, or the supply can be taken to the fitting through a conduit entry knockout in each end plate. Lamps may be switched in pairs if desired, the connections being arranged for this purpose.

THORN ELECTRICAL INDUSTRIES, LTD., are also producing a fluorescent fitting for shop window lighting, the Atlas FW/2080, which uses two 80-w. 5-ft. lamps. This unit consists of an anodised aluminium reflector suitable for ceiling fixing or suspension. In order to achieve maximum flexibility and to cater for restricted spaces the control-gear box can be housed remotely in a convenient position. The price of this fitting, complete with control-gear box and two lamps, is £14 10s., plus purchase tax on the lamps.



G.E.C. four-lamp fitting designed to give wide distribution of light in shop windows.

## Catalogues Received

SIMPLEX ELECTRIC CO., LTD.—Price lists, No. SW1770—Switch and Fuse gear; No. CF1769—Conduit fittings.

GENERAL ELECTRIC CO., LTD.—Booklet describing range of new and improved household appliances; fittings and lamps for shop window lighting, floodlighting signs and decorations.

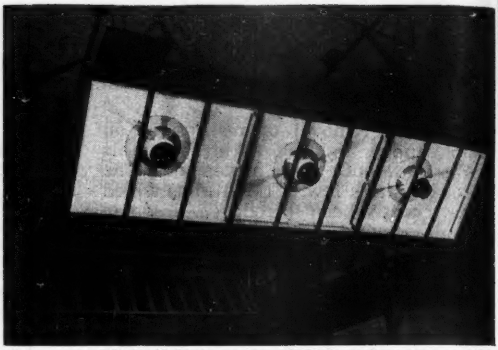
THE B.T.H. CO., LTD.—Mazdalux Cold Cathode Lighting Fittings.

COURTNEY POPE (ELECTRICAL), LTD.—Fluorescent lighting fittings.

## Church Lighting

The Central Council for the Care of Churches, which is the advisory authority responsible for all Church of England buildings, would be glad to receive catalogues from all the firms making light fittings suitable for use in churches: Address: Church House, Westminster, S.W.1.

# Television Studio Lighting



Three "Softlight" fittings in a B.B.C. television studio at Alexandra Palace.

Television artists work under lights as powerful as those used in film studios, but they do not have the opportunity of resting between shots to recover from the effects of heat. Their discomfort has been considerable in the past because it has been necessary to light the studios with tungsten filament lamps. Carbon arc lamps, as used in film studios, have certain drawbacks for television, notably the frequency with which carbons have to be changed, and the problem of ensuring completely silent operation.

Recently, however, two B.B.C. television studios at the Alexandra Palace have been equipped with mercury-cadmium compact source lamps which are used in special "Softlight" fittings, designed and developed by the research laboratories of the General Electric Co., Ltd., in conjunction with the B.B.C. television engineers.

Originally the "Softlights" consisted of 48 100-watt tungsten lamps in enamelled reflectors, and were about 12 ft. x 4 ft. in area mounted just above the performers' heads. The large area of the light source was necessary to soften shadows, and to avoid shadows being cast by the microphone booms and so on. It was, therefore, essential to retain the large area in the new fittings.

The new "Softlight" fittings are accordingly designed to give indirect illumination, the light from the 2½-kw. compact source lamp in each being redirected by reflectors and a refractor on to the matt-white inside surface of the housing, which forms the effective light source.

No appreciable direct light from the lamp reaches the working plane. Three of the fittings are mounted side by side in each studio, forming together a source of light 15 ft. long by 4 ft. wide. The new lamps consume 7.5 kw. per studio as against 4.8 kw. when the tungsten lamps were used, but the illumination is increased by 75 per cent. while the heating effect is negligible in comparison with that from the previous lighting.

A television "set" illuminated for a broadcast by the "Softlight" fittings.

The compact source lamps at the Alexandra Palace are the first of their kind to be installed permanently in a television studio.

Their advantages for such work are numerous, for the small infra-red radiation is suited to the characteristics of the television camera and contributes towards good monochrome rendering of the scenes televised.

# The EDITOR Replies

Considerable interest—not confined to this country—has been aroused by the article on "Light and Decoration in a Windowless Factory," which we published in December last year. Inadvertently, the name and location of the factory was not given in the article, and interested readers have since asked for this information. The factory is situated at Foots Cray in Kent, and is one of the various factories of Messrs. Standard Telephones and Cables, Ltd. The general lighting by fluorescent artificial windows is a remarkably successful outcome of design and installation by the user; it reflects great credit upon those directly responsible for it, as well as upon the management, without whose unusually keen appreciation of the importance of the visible environment of the worker this installation might not have been given a trial. We understand that a group of medical men specialising in Public Health and in Industrial Health, who recently visited the factory, were much impressed by the naturalness of the lighting and the cheerful environment achieved by this means in conjunction with the colouring of the interior.

One of our correspondents suggests that the "appearance design" of lighting fittings has not advanced to the same extent as design for essential function, i.e., for flux distribution. "Lighting fittings," he says, "are essentially functional, but so often aesthetically meaningless." Lighting engineers receive technical training, but no training in the appreciation of shape and form, and our correspondent thinks this is producing an ever widening gap between technical design and appearance design. Not everyone will agree with this contention, and we imagine that, among those who will, there are various schools of thought on the subject of aesthetically meaningful design. Nevertheless, so long as lighting fittings cannot be kept out of view, the combination of pleasing appearance with functional efficiency is very desirable and, perhaps, something might be done to cultivate good taste among student lighting engineers in the matter of fittings design.

Perusal of a recent issue of a certain house magazine tempts us to belie the heading of this page by posing, instead of replying to, a query. The magazine contains a photograph of a factory where fluorescent lamps are being made and shows that the factory itself is lighted by tungsten lamps in standard dispersive reflectors. Is this an instance of praiseworthy self-sacrifice to supply the demands of others, or of favouritism for an elder "child"?

Nowadays, it is almost invariably recommended that the working illumination required in offices should be obtained by a system of general lighting. The reasons for this are well known, but the occupants of private offices often express a preference for desk lamps, and seem to like having their desks well illuminated without any general lighting. No doubt concentration upon the work is encouraged by purely local lighting, just as concentration upon the screen is encouraged in cinemas by a dark auditorium. The usual objections to local without general lighting certainly do not apply in all single occupant rooms. Although provision has to be made for occasional general illumination to a reasonable level, it cannot be maintained that visual efficiency is impaired when the general lighting is not used, providing the occupant does not want to shift his gaze frequently from the work to the general surrounds.

## Personal

We understand that Mr. P. S. BARTON is resigning from his appointment as southern area manager to the Benjamin Electric, Ltd., after 20 years' service with the company. He is to take up an appointment as general sales manager to Courtney, Pope (Electrical), Ltd., on June 1.

Mr. D. L. TABRAHAM, at present manager of the G.E.C. lighting department in Newcastle, will shortly be taking over another appointment at the company's head offices at Kingsway. The hon. secretaryship of the I.E.S. Newcastle Centre will, therefore, again change hands, and we gather that it is to be taken over by Mr. G. R. HANSON.

Mr. N. V. EVERTON has been appointed a director of the Edison Swan Electric Company, Ltd.

Mr. ALFRED B. READ, director of design to Messrs. Troughton and Young, Ltd., has been elected Master of the Faculty of Royal Designers for Industry. He is a specialist in lighting fittings.

I.E.S. members will wish to join us in congratulating MR. P. J. WALDRAM, an original member of the Society and the father of the I.E.S. President, on attaining the age of 80 years on April 27 last. We learn with regret that his birthday was spent in hospital, where he is being treated for a serious illness which developed a few days earlier; but his condition is improving slowly, and we hope that he may make a good recovery. Mr. Waldram took part in the discussion at an I.E.S. meeting last session. We send him the good wishes of the Society.

## SITUATION VACANT

COMMERCIAL TECHNICAL ASSISTANT, aged 26 to 30, required by Fluorescent Lighting Division of progressive electrical organisation in London. Applicants must have had a sound education, passed at least the Ord. Nat. Cert. in Elec. Eng., be a good Comm. Techn. correspondent and have an aptitude for intensive commercial work.—Applications, giving age, experience, qualifications and salary required to Box 795, LIGHT AND LIGHTING, 32, Victoria-street, London, S.W.1.